



## Technical Memorandum

### DEVELOPMENT IMPACTS

#### Appendix A

### Literature Review of Studies on the Economic Development Impact of Passenger Rail

July 26, 2010

#### Introduction

Many studies have been conducted to estimate the economic development impact of passenger rail with varying results. These studies have calculated the impact to retail, commercial and residential properties and looked at various rail technologies including light rail, heavy rail, commuter rail and streetcar. The results can be impacted by many factors including development policies, access to other transportation modes, amenities surrounding the rail stops, amount of time since the rail system opened and the rail mode. This technical memorandum attempts to summarize a fraction of the various studies that have been conducted to provide an overview and understanding of rail economic impacts in various communities.

As noted in the review below, the results about the economic impacts of rail vary just as the modes and cities varied. Cities like Dallas saw positive economic impacts as a result of the light rail system and yet other communities like Los Angeles did not have consistent impacts. Premiums were seen for one type of property and decreases for other types of properties in the same city along the same rail line. One finding noted "having services and public uses nearby like restaurants, repair shops, pubs, and child-care centers also increased the commercial land values ..." (*Cervero & Duncan, Rail Transit's Value-Added: Effects of Proximity to Light and Commuter Rail Transit on Commercial Land Values in Santa Clara County, California, June 2001*)

#### Literature Review

***The Initial Economic Impacts of the DART LRT System* by Bernard L. Weinstein, Ph.D and Terry L. Clower, Ph.D, July 1999**

This report studies both the changes in property valuations and the growth of retail sales since the opening of DART rail because there was interest in determining the economic effects of DART Light Rail (LRT) after its opening in 1996. In summary, the property valuation growth near DART LRT stations was



approximately 25 percent greater than the comparable properties outside of the LRT station area and retail sales grew by 36.2 percent in the Central Business District (CBD) compared to citywide growth of 3.6 percent.

Appraisal data was gathered on approximately 700 commercial and residential properties within a ¼ mile of the 15 rail stations and similar data was gathered on 160 properties in comparable neighborhoods. From the period 1994 to 1998, property values around rail stations increased in many of the areas examined. A summary of average percent change in total property values by type is included in Table 1 below.

**Table 1: Average Percent Change in Total Property Values (1994 – 1998)**

	Retail	Office	Residential	Industrial	Vacant	All Properties
<b>DART Stations</b>	12.39%	28.97%	11.02%	3.79%	(5.12%)	15.98%
<b>Comparable Areas</b>	7.79%	6.32%	16.17%	0.00%	26.38%	12.86%

Additionally, commercial occupancy rates and rents for properties within ¼ mile of DART stations were evaluated. These rates were evaluated from 1994 to 1998 on approximately 200 office buildings, retail properties and industrial sites. A summary of the changes by property type are included in Table 2 below.

**Table 2: Average Percentage Changes in Occupancy and Rents near LRT Stations**

Type of Property	1994 Occupancy Rates	1998 Occupancy Rates	Occupancy Rate Percentage Change	Rent Percentage Increase
<b>Class A</b>	80.2	88.5	10.4	47.4
<b>Class B</b>	73.0	77.9	6.7	40.4
<b>Class C</b>	44.8	46.4	3.6	20.9
<b>Community Retail</b>	94.8	92.8	(2.1)	17.2
<b>Neighborhood Retail</b>	91.1	94.1	3.3	6.3
<b>Strip Retail</b>	86.8	90.4	4.2	18.4
<b>Industrial</b>	75.8	87.9	16.0	27.4

In all cases, except the community retail, occupancy rates increased and the increases ranged from 3.3 percent to 16 percent. The average rents in all the types of properties increased from 6.3 percent on the low end to 47.4 percent on the high end.



Finally, gross sales in the CBD were compared from the opening of DART rail in June 1996 on a quarter by quarter basis. Year over year total retail sales growth in the CBD was 36.2 percent compared to a citywide growth of 3.6 percent.

This study shows that the DART LRT has had a positive impact on property values, occupancy rates and retail sales in areas near a LRT station.

## ***An Assessment of the DART LRT on Taxable Property Valuations and Transit Oriented Development by Bernard L. Weinstein, Ph.D and Terry L. Clower, Ph.D, September 2002***

This report is intended to update the work done in previous studies regarding the economic impacts of DART LRT and how the taxable property values have been affected by the location to a DART LRT station. The findings of the report are that the median values of residential properties increased 32.1 percent near the DART rail stations compared to 19.5 percent in the control group areas. For office buildings, the increase was 24.7 percent for the DART properties versus 11.5 percent for the non-DART properties. However, proximity to DART rail does not appear to have a significant impact on retail and industrial property valuations.

All properties located within ¼ mile of a LRT station were included in the study area. The increases in property valuations for these properties were compared to similar properties not located in the study area. The increase in valuations was calculated by analyzing the data from the Dallas County Appraisal system for the period 1997 to 2001. Additionally, only stations, a total of 23, outside of the Central Business District (CBD) were included in the sample. The 23 stations include Arapaho, Cedars, City Place, Corinth, Forest Lane, Galatyn Park, Hampton, Illinois, Kiest, LBJ/Central, LBJ/Skillman, Ledbetter, Lovers Lane, Mockingbird Lane, Morrell, Park Lane, Spring Valley, Tyler/Vernon, VA Hospital, Walnut Hill Lane, Westmoreland, White Rock and Zoo.

The properties were segregated into the following categories: residential, office, retail and industrial. The residential properties were further segregated between those with improvements and those without or vacant in 2001. Table 3 below summarizes the findings of the analysis using the median values.

**Table 3: Percent Change in Property Valuations**

Category	% change in valuation (1997 - 2001)	
	Located near DART	Not located near DART
Office	24.7%	11.5%
Residential	32.1%	19.5%
Residential – vacant	11.1%	0.0%
Retail	28.3%	30.4%
Industrial	13.0%	21.5%

Office and Residential (improved and vacant) located near a DART LRT station had the largest increase in property valuation as compared to those not located near a DART station. The change in retail property



valuations were basically the same in both groups. The industrial property valuations were not positively impacted by being located closer to a DART station.

***Assessment of the Potential Fiscal Impacts of Existing and Proposed Transit-Oriented Development in the Dallas Area Rapid Transit Service Area by Terry L. Clower, Ph.D, Bernard Weinstein, Ph.D. and Michael Seman, M.S., (November 2007)***

Increases in the market value of properties located near rail stations have been widely recognized in various studies. Gains in property valuations and the potential for increased sales tax revenues from commercial activities located in transit-oriented development (TOD) projects offer the opportunity for new revenue sources for local taxing entities. This study focuses on the opportunities for new revenue sources as a result of the increase in the property valuations.

This study used both quantitative and qualitative methodologies and the first step in assessing the value of transit-oriented development near the DART LRT stations included reviewing news stories published since 1999 on TOD projects. Another method to identify the TOD projects near the rail stations included looking at aerial photography for the locations near rail stations for the years 1997 and 2005. Field observations were another important step in the review process. Once all of the developments were identified, the researchers made judgments about which developments would have occurred with or without DART. They removed over \$600 million from the total value of existing or proposed projects to account for those projects that would have happened without the presence of DART rail. Data was also collected on the taxable property values from county records.

Based on this approach, the study identified the following economic impacts:

- The total value of all current and projected developments near DART LRT stations is \$4.9 billion since 1999
- The total value of projects attributable to DART LRT stations since 1999 is \$4.26 billion
- The value of taxable real and business properties (associated with projects reviewed) exceeds \$2.84 billion
- This tax base has the potential to generate \$16.8 million annually in property taxes for the DART member cities
- The retail component of the TOD projects in the DART service area will generate over \$660 million in annual taxable retail sales
- The retail component will increase local revenues by approximately \$6.6 million annually
- The total increase in local revenues annually will be approximately \$23.5 million when all of the planned projects are completed

***Portland Streetcar Development Oriented Transit Study prepared by the Office of Transportation and Portland Streetcar, Inc., April 2008***

The Portland Streetcar was developed as part of a unique strategy to link high quality transit with major redevelopment plans. The initial alignment was identified in 1997 and the streetcar opened for business in July 2001. City and business leaders understood that keeping Downtown Portland healthy and adding



a large amount of new housing to downtown districts was critical to the region's economic stability. These leaders worked together to develop a public/private partnership strategy to implement the streetcar and to positively impact the City of Portland. Funding for the project came from a multitude of sources that included parking revenues, Tax Increment Financing (TIF), property owner assessments (i.e. a PID), regional transportation funds, city funds and other sources.

The initial alignment for the streetcar project was to connect to major redevelopment areas in Portland; 70 acres of abandoned rail yards and a contaminated brownfield site just north of Downtown (the Pearl District) with 128 acres of underused or vacant industrial land at the opposite end of Downtown (the South Waterfront). The investment in streetcar has changed development patterns and yield of properties in Portland. A study by E.D. Hoove & Company in 2005 found that the "properties located closest to the streetcar line have experienced the largest share of development – and at Floor Area Ratios (FARs) that more closely approach the properties' zoned density potential – than properties situated further from the streetcar alignment."

Some of the additional findings of the Hoove study include:

- New development achieved an average of 90% of the FAR potential within one block of the streetcar and the percentage drops to 43% at three or more blocks from the alignment
- 55% of all new development in the CBD occurred within one block of the streetcar compared to 19% before the streetcar line

***Light-Rail Transit in America: Policy Issues and Prospects for Economic Development by Thomas A. Garrett, August 2004***

In addition to summarizing the economic issues around light rail, the impact generally to property values and TOD, this study looks at the specific impacts of LRT to property values in St. Louis. The initial phase of the LRT in St. Louis was completed and began service in July 1993. This line is 17 miles in length and serves 18 stations. It connects East St. Louis in Illinois to the Lambert-St. Louis International Airport while serving the downtown area. The total capital cost of the project was \$464 million with \$348 million funded by the Federal Transit Administration (FTA) and the remaining \$116 million coming from sales tax increases and local bond issues. The system has been expanded and as of 2004, the MetroLink system has 38 miles of track, 28 stations and an average weekday ridership of 55,000.

In evaluating the property value impacts of the LRT in St. Louis, the author looked at both the accessibility effect and the nuisance effect. The accessibility effect is based on the premise that an improvement to the area's transportation structure will have a positive impact on property values. The nuisance effect is based on the premise that the increased noise, lighting and other nuisances from LRT will have a negative impact on property values.

The model was developed to estimate both of these impacts and included the following variables that could impact the single-family house prices:



- House Characteristics – price, number of bedrooms and bathrooms, number of stories, garage (yes/no), pool (yes/no), age, lot size and living area
- Variable to Measure Nuisance Effect – home distance to nearest MetroLink track
- Neighborhood Characteristics – distance to nearest highway interchange, percent of residents with college education, per capita personal income, property tax rates, school district test scores, nearest light-rail station has a park-and-ride (yes/no)
- Variable to Measure Accessibility Effect – home distance to nearest MetroLink station

The analysis used data on single family homes that were located within one mile of a MetroLink station and that were sold between 1998 and 2001. Because previous studies showed that the effect of an LRT station on property values is strongest up to 700 meters or approximately 2,300 feet, this analysis looked at homes located up to 2,300 feet from an LRT station and those located beyond the 2,300 feet. A total of 1,516 homes were included in the analysis.

The results of the model show that average house prices increase \$143.49 for every 10 feet closer to the LRT station beginning at 1,450 feet. Average house prices increase \$72.37 for every 10 feet closer to a station between 1,450 feet and 2,300 feet and there is no effect beyond 2,300 feet. The model did not identify any nuisance effect.

***The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-analysis by Ghebreegziabihir Debrezion, Eric Pels and Piet Rietveld, June 2007***

In reviewing the results of the impacts of rail on property valuations summarized in other studies and the variations in the results, this report attempts to find a systematic explanation for those variations. The development of the model looked at seven categories of variables and they included the type of property under consideration, the type of railway station, the type of model used to derive the valuation results, the presence of specific variables related to accessibility, demographic features and the time of the data.

The effects are presented by looking at them from two proximity considerations. The first is to analyze the effects within a range of  $\frac{1}{4}$  mile from the station and the second is to look at a more global perspective and analyze the results based on a continuous measure of distance for a wider distance range. The results of this analysis show that commuter rail stations have a significantly higher impact on property values as compared to light or heavy railway stations in the local analysis. On average, commercial properties within  $\frac{1}{4}$  mile of the station sell or rent 12.2% higher than residential properties within the same distance. In looking at the global effects, the relative impact is reversed. On average, for every 250 m closer to the station, the valuations are 2.3% higher for residential properties compared to commercial properties.



***Land Value Impacts of Rail Transit Services in San Diego County by Robert Cervero and Michael Duncan, June 2002***

The land value impacts of the various rail transit services in San Diego were studied in this report. Prior to this study, several other studies had been completed that looked at the rail impacts in the early stages of the projects. Those impacts have changed as the projects have matured.

The data used to calculate the economic development impacts was taken from *Metroscan*, a database that contains monthly information on all real estate transactions recorded in the county office. The data for the residential sample is from year 2002 and for the commercial sample is from 1999 – 2001. The commercial data is spread out over three years to obtain a sufficient sample size. There were four types of land uses evaluated and they include: Residential – Multi-family, Residential – Condominiums, Residential – Single-Family Housing and Commercial. The commercial category was broken down further but approximately 2/3 of the commercial properties included offices, banks and clinics.

Additional data used in the analysis included employment and household income data, expressed at the traffic analysis zone (TAZ) level which came from SANDAG. Other SANDAG data included travel times, population, housing units, and various socio-demographic attributes. Using hedonic price models, positive land value premiums were found for different land uses in the different rail corridors in San Diego County. In summary, positive benefits were noted with 46% premiums for condominiums and 17% for single family housing near Coaster commuter rail stations in the north county. Additionally, 17% and 10% premiums were noted for multi-family housing near the East and South Line stations, respectively and for commercial properties, 91% premiums for parcels near downtown Coaster stations and 72% for parcels near Trolley stations in the Mission Valley. Finally, positive results in the range of 2% to 6% were found for multi-family parcels along all Trolley and Coaster corridors.

***Rail Transit's Value-Added: Effects of Proximity to Light and Commuter Rail Transit on Commercial Land Values in Santa Clara County, California by Robert Cervero and Michael Duncan, June 2001***

This study focuses on the property value impacts of commuter and light rail to commercial properties in Santa Clara, California. The effects on property values were calculated using only the land values. The theory in this approach is that the accessibility benefits get capitalized into the land values and not on the building or other on-site improvements. This approach also avoids the need to fully specify and measure all factors like on-site cabling or quality of building materials.

LRT services began in 1991 with the Guadalupe corridor which is 21 miles long and connects the Silicon Valley to downtown San Jose and several residential communities. A 7.6 mile extension (Tasman West) was completed in 2000 and the Tasman East line was completed in 2001. Service also consists of two commuter rail lines including CalTrain and Altamont Commuter Express.

Transit-oriented development has taken off in Santa Clara County. An estimated 4,500 housing units and 9 million square feet of commercial/office space was added within walking distance of the Tasman West LRT corridor between 1997 -1999. TODs have also formed near CalTrain stations. The Mountain



View TOD is an 18 acre, compact, mixed-use and walkable development that replaced a dying shopping mall.

The data used to calculate the economic development impacts was taken from *Metroscan*, a database that contains monthly information on all real estate transactions recorded in the county office. The data for the commercial, office and light industrial land value samples are from 1998 and 1999. The 1998 values were then increased by seven percent to adjust them to 1999 values.

The commercial categories were broken down into eight distinct groups but the professional activities (offices, banks and clinics, along with retail outside of shopping centers) accounted for more than 80 percent of the samples taken. Using hedonic price models, positive land value premiums were found for commercial properties in proximity to LRT stations. This is contrary to previous studies. This study found that being within walking distance to a LRT station in Santa Clara county increased land values on average by around 23 percent. Properties that were within ¼ mile of a CalTrain station saw a more than 120 percent premium above the mean value.

Other findings in the report include “having services and public uses nearby like restaurants, repair shops, pubs, and child-care centers also increased commercial land values in Santa Clara County, suggesting a market demand for particular combinations of commercial activities.” This combination of activities allows the commuter to consolidate trips and get several things done at the same place and many times without the need of a car.

## ***Land Value Impacts of Rail Transit Services in Los Angeles County by Robert Cervero and Michael Duncan, June 2002***

This report looks at the land value impacts of heavy rail (Metro Red Line), commuter rail (MetroLink), light rail (Metro Green and Blue lines) and bus rapid transit (BRT) (Wilshire-Whittier Boulevards and Ventura Boulevard) in Los Angeles County. The rail services run in dedicated rights-of-way while the BRT operates in mixed-traffic conditions. The Blue LRT Line connects 22 stations along a 22 mile corridor and the Green LRT Line is 20 miles in length with 14 stations. The Red Line is 17.4 miles in length and operates solely underground and connects Union Station with North Hollywood. The MetroLink system operates on 416 miles with 49 stations. The Metro Rapid BRT lines include the Wilshire-Whittier Boulevards corridor which is 26 miles long and the Ventura Boulevard Corridor which is 16 miles in length.

TOD has grown in Los Angeles County with one of the first in that community being the redevelopment of Union Station. Five MetroLink lines, the Red Line and Amtrak all connect at Union Station. The project included the building of the transit authority’s headquarters in addition to the Metropolitan Water District headquarters. Two mixed housing –commercial TODs were developed – one in downtown Long Beach and the other in downtown Pasadena. The Long Beach TOD was built one block from the terminus of the Blue Line. The other TOD was built in anticipation of the rail line extension to Pasadena. Mixed use developments on top of the subway stations have grown substantially. The most financially substantial development includes a 640,000 square foot mega-entertainment-retail complex



and 640 room hotel which nets the transit authority over half a million dollars annually with a 99 year ground lease.

The data used to calculate the economic development impacts was taken from *Metroscan*, a database that contains monthly information on all real estate transactions recorded in the county office. The data for the residential sample is from year 2000 and for the commercial sample is from 1999 – 2001. The commercial data is spread out over three years to obtain a sufficient sample size. There were four types of land uses evaluated and they include: Residential – multi-family, Residential – Condominiums, Residential – Single-Family Housing and Commercial. The commercial category was broken down further but approximately 2/3 of the commercial properties included professional offices and retail.

Additional data used in the analysis included employment and household income data, expressed at the traffic analysis zone (TAZ) level came from Southern California Associations of Governments (SCAG). Other SCAG data included travel times, population, housing units, and various socio-demographic attributes. Using hedonic price models, land value impacts in Los Angeles were uneven and inconsistent. In some instances, like the Red Line, premiums were only recorded for multi-family retail housing. Residential properties near a BRT station sold for less but commercial properties sold for more.

***The Impact of Rapid Rail Transit on Economic Development: The Case of Atlanta's MARTA by Christopher R. Bollinger and Keith R. Ihlandfeldt, (August 1996)***

This study focuses on the impact of MARTA on population and employment in the vicinity of MARTA stations. The model used in this study allows for the determination of population and employment changes at the census tract level. The model used in this study is a general equilibrium model that allows population and employment to be mutually affected. Changes were measured for population and employment for the census tract from 1980 to 1990. Tracts containing a portion of the ¼ mile impact area are included in the station tracts for the calculations.

The results of the study indicate that there was no impact on population and employment in the vicinity of MARTA stations but that MARTA has altered the composition of employment in favor of public sector only in those areas with high levels of commercial activity.

***Rail Transit Investments, Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Transit Systems by John Landis, Subhrajit Guhathakurta, William Huang, and Ming Zhang with Bruce Fukuji and Sourav Sen, July 1995***

This report looks at five rail systems in California which include BART, CalTrain, Sacramento Light Rail, the San Diego Trolley and Santa Clara Light Rail. The purpose of the study is to clarify the relationships between land uses and property values. The following relationships were studied:

- Relationships between rail transit investments and single-family home prices
- Relationships between rail transit investments and commercial property values
- Relationships between rail transit investments and station area land use changes
- Relationships between rail transit investments and metropolitan-scale land use changes



Using statistical models, the findings of the report show that transit does impact land values in California but not consistently. For example, the 1990 home price premium for a single-family home nearest a BART station in Alameda County and Contra Costa County were \$2.39 and \$1.96 per meter respectively. In San Diego, the capitalization effect on home prices was not universal. CalTrain and the LRT systems in San Jose and Sacramento did not generate significant capitalization benefits. These systems provide limited service, serve a limited market, operate at slower speeds and do not help reduce freeway construction.

Commercial property values were not consistently capitalized because of its location to a rail station. If measured just on the basis of price per square foot of lot area, retail, office and industrial properties in Alameda County near BART stations did sell at a premium but if measured to account for differences in lot and building size, Alameda, Contra Costa and San Diego office retail and industrial properties did not sell at a premium for the same time period. Regarding station area land use changes, station proximity by itself does not seem to have a large effect on nearby land use patterns. The same result was found for four San Diego trolley stations between 1980 and 1994. On a metropolitan scale, mixed results were found in the study. The closer a vacant site was to a BART station in Alameda County, the more likely it was to be developed into commercial or industrial use between 1985 and 1990. In Contra Costa County, the opposite was true. In both counties, however, vacant sites were less likely to be developed into residential use.

## Bibliography

Bollinger, C., & Ihlanfeldt, K. (1996). *The Impact of Rapid Rail Transit on Economic Development: The Case of Atlanta's MARTA*. Atlanta: Academic Press.

Cervero, R., & Duncan, M. (June 2002). *Land Value Impacts of Rail Transit Services in Los Angeles County*. Washington, D.C: National Association of Realtors - Urban Land Institute.

Cervero, R., & Duncan, M. (2002). *Land Value Impacts of Rail Transit Services in San Diego County*. National Association of Realtors - Urban Land Institute.

Cervero, R., & Duncan, M. (June 2001). *Rail Transit's Value-Added: Effects of Proximity to Light and Commuter Rail Transit on Commercial Land Values in Santa Clara County, California*. Washington, D.C.: Urban Land Institute - National Association of Realtors.

Clower, P. T., Weinstein, P. B., & Seman, M. M. (2007). *Assessment of the Potential Fiscal Impacts of Existing and Proposed Transit-Oriented Development in the Dallas Area Rapid Transit Service Area*. Dallas: Center for Economic Development and Research; University of North Texas.

Debrezion, G., Pels, E., & Rietveld, P. (2007). *The Impact of Railway Stations on Residential and Commercial Property Value: A Meta-analysis*. Springer.

Garrett, T. A. (2004). *Light-Rail Transit in America*. St. Louis: Federal Reserve Bank of St. Louis.



Landis, J., Guhathakurta, S., Huang, W., Zhang, M., Fukuji, B., & Sen, S. (1995). *Rail Transit Investments, Real Estate Values and Land Use Change: A Comparative Analysis of Five California Systems*. Berkeley: University of California at Berkeley.

Portland Office of Transportation and Portland Streetcar, Inc. (2008). *Portland Streetcar - Development Oriented Transit*. Portland.

Weinstein, P. B., & Clower, P. T. (2002). *An Assessment of the DART LRT on Taxable Property Valuations and Transit Oriented Development*. Dallas: University of North Texas; Center for Economic Development and Research.

Weinstein, P. B., & Clower, P. T. (1999). *The Initial Economic Impacts of the DART LRT System*. Dallas: University of North Texas; Center for Economic Development and Research.